

# Appendix C

## Proprietary Hydrology and Hydraulics Computer Programs

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## Appendix C-1 HydroCAD

HydroCAD, developed by Applied Microcomputer Systems, is a computer aided design program, primarily incorporating a hydrograph generation and routing program. (Ref: HydroCAD Stormwater Modeling System, Applied Microcomputer Systems, Page Hill Road, Chocorua, New Hampshire 03817). HydroCAD accomplishes both reservoir and valley routing, providing SCS TR-20 accuracy and SCS TR-55 compatibility in a CAD type format. HydroCAD provides the user with several methodologies for determining; the time of concentration, runoff, and hydrograph generation. Time of Concentration methods include; the Curve Number Method, TR-55 Methods, and the Upland Method. Runoff can be determined by the Rational Method and SCS TR-20 methods. Additionally, HydroCAD performs reach routing, pond routing, and hydraulic control structure analysis, and allows for link calculations to import external hydrographs into the routing diagram. The routing diagram, a major feature of HydroCAD, provides a graphical representation of the watershed characteristics, or structures. HydroCAD generates tabular and graphical hydrographs.

## Appendix C-2 Haestad Methods

Haestad Methods, Inc. has developed Pond Pack consisting of two integrated programs; Quick TR-55 and Pond-2. (Ref: Haestad Methods, Civil Engineering Software, 37 Brookside Road, Waterbury Connecticut 06708). These programs, designed to work together, incorporate identical interfaces. Their pull down menus and data entry screens are consistent. Quick TR-55 provides general site drainage and detention pond sizing and routing and is compatible with SCS TR-55. Additionally, Quick TR-55 can model hydrology utilizing the Rational and Modified Rational methods, the Santa Barbara Urban Hydrograph procedure, and pond sizing methods. Pond-2 provides detention pond design and analysis and can add and route hydrographs, estimate storage requirements, compute design volumes, develop rating curves for single and multi-stage outlet control structures and plot inflow and outflow hydrographs. Hydrographs can also be imported from HEC-1 and TR-20 programs or any spread sheet type format.

Single or multiple storm events can be routed through a pond and the outflow hydrographs used for other applications. Pond-2 utilizes the conical method to compute pond volumes from a grading plan allowing for the conversion from planimeter or CAD readings to volumes.

## Appendix C-3 Dodson & Associates, Inc.

Dodson & Associates, Inc. Hydrologists and Civil Engineers has developed HYDROPRO, HYDROCALC, and ProStorm series computer modeling programs (Ref: Dodson & Associates, Inc. 5629 FM 1960 West, Suite 314, Houston, Texas, 77069).

### **HYDROPRO**

HYDROPRO series programs contain ProHEC1 and ProHEC2 models which are enhanced versions of the Army Corps of Engineers watershed analysis and floodplain analysis programs. Both programs are driven by a master menu and include ProED, the Dodson Professional Editor. ProED functions as a spreadsheet program, similar to Lotus 1-2-3, for data input and editing.

ProHEC1, based on HEC-1, version 4.0, can be used to; compute hydrographs for simple and complex stream systems, design stormwater detention basins, analyze reservoirs and perform dam breach analysis, and compute urban runoff using the kinematic wave method.

ProHEC2 computes flood plain widths and water surface elevations along a river or stream channel. ProHEC2 also designs channel improvements and performs culvert and bridge hydraulic analysis. ProHEC2 is based on HEC-2, version 4.6.

### **HYDROCALC**

HYDROCALC series programs contain HYDROCALC Hydraulics and HYDROCALC Hydrology models. Both programs are fully compatible with standard manual methods of computation and analysis and provide instant graphics capabilities.

HYDROCALC Hydraulics contains programs to analyze; trapezoidal channels, box culverts, circular channels, and pipe culverts. Program results provide water surface profile, critical depth and rating curve computations for channels. Culverts are analyzed using the Federal Highway Administration methods.

HYDROCALC Hydraulics contains programs to compute runoff and design detention basins in small, projects using; the Rational Method, the Triangular Hydrograph Detention Program, the Quick Hydrograph Program, or the Small Watershed Method Program. The Quick Hydrograph Method incorporates SCS methods and includes SCS storm distributions. Additionally this method computes Corps of Engineers storm distributions and includes Corps of Engineers hydrograph methods. Single sub-area results are consistent with HEC-1 results.

### **ProStorm**

ProStorm, a recently developed program, contains menus similar to ProHEC1 and ProHEC2 and also contains ProED. ProStorm is modeled after the Army Corps of Engineers STORM program. ProStorm performs an analysis of runoff quantity and quality from urban or nonurban watersheds.

Runoff quantity can be computed by; the SCS Curve Number Technique, the coefficient method or a combination of both. The SCS method utilizes a rainfall-runoff technique based on antecedent moisture conditions for each rainfall event. The coefficient method specifies that a certain fraction of rainfall will runoff the site during each hour of the rainfall event. The combination option uses the SCS method for pervious areas and the coefficient method for impervious surfaces.

Runoff quality computes pollutant accumulation by the dust and dirt method and the daily accumulation method. The dust and dirt method assumes that all pollutants are associated with dust and dirt accumulated in streets, and that the pollutants are expressed as a fraction of the dust and dirt for each use. This method should not be used in areas where a significant portion of pollutants originate from sources other than streets or in cases where nonurban uses represent a major portion of the watershed. The daily accumulation method, used in areas where a significant portion of pollutants originate from areas other than streets, or in non-urban land uses, incorporates daily accumulation rates of each pollutant.

## Appendix C-4: Engineering Data Systems Corporation

Engineering Data Systems Corporation has developed several hydrological programs; Watershed Modeling, Water Surface Profiling, Storm Sewer and Sanitary Sewer. (Ref: Engineering Data Systems Corporation, Clock Tower West, Suite G, Dubuque, Iowa 52003). All programs are menu driven and information can be transmitted between programs, or imported from one program to another. All programs include the use of Reference Library, a memory resident utility program providing online help and reference information. Reference Library is activated through a "Hot-key" which interrupts the hydrology program in use and displays the reference screens. These screens contain information pertaining to roughness coefficients, curve numbers, runoff coefficients and rainfall data.

### **Watershed Modeling**

Watershed Modeling analyzes single runoff hydrographs, combines hydrographs, performs flood routing and designs ponds. Watershed analysis is accomplished, utilizing SCS or the Rational methods, by selecting the desired function from the menu, beginning at the uppermost reach of the watershed. The menu allows for channel routing or reservoir routing modeling.

### **Water Surface Profiling**

Water Surface Profiling analyzes and computes water surface profiles through channels and stream networks. Hydraulic analysis is performed using the Modified Standard Step Method. Pressure and non pressure flows through channels, culverts or bridge sections, can be analyzed and the results plotted as cross-sections, plan views and hydraulic profiles. The program provides for sub and super critical flow regimes.

### **Storm Sewer**

Storm Sewers is a computer model that designs and analyzes the hydraulic grade line for storm sewer systems utilizing the Standard Step Method. Hydraulic profiles and rainfall intensity curves are calculated and the hydraulic grade results plotted to the printer or screen. Capacities of existing sewer systems can also be analyzed.